OIPE JC139
JUN 17 2005
PATENT & TRADEMARK OFFICE

FIG.1
(PRIOR ART)

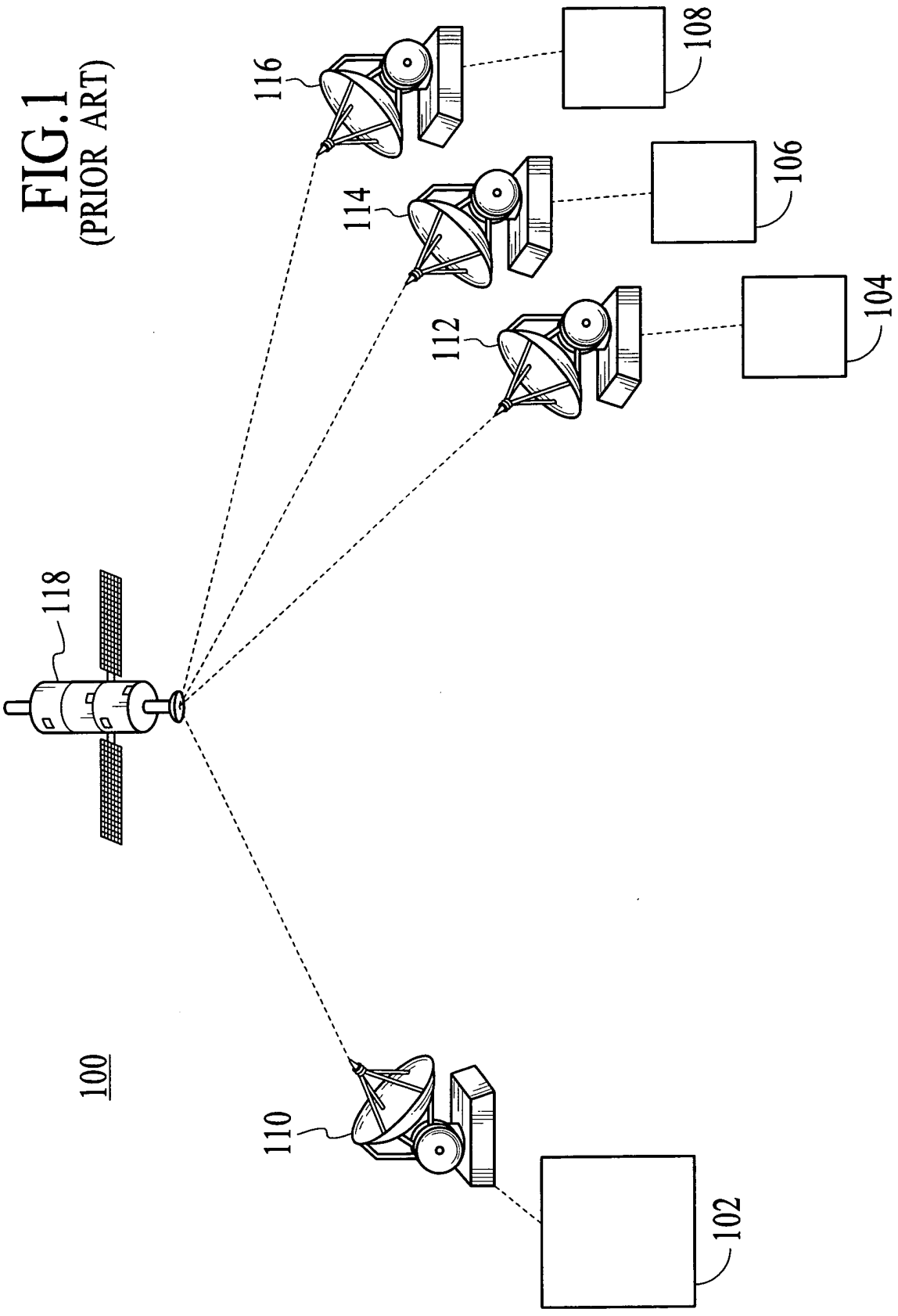


FIG.2A

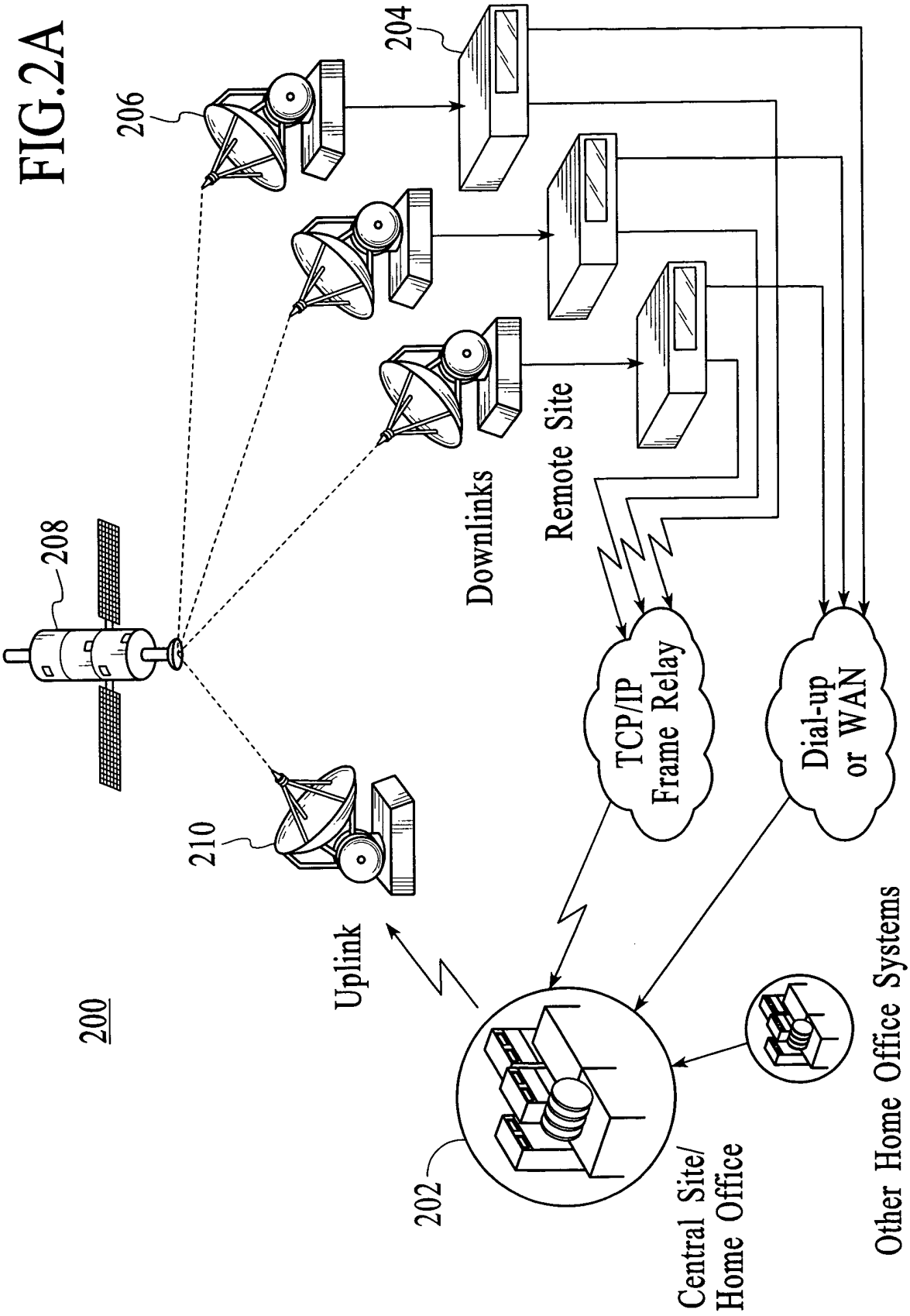
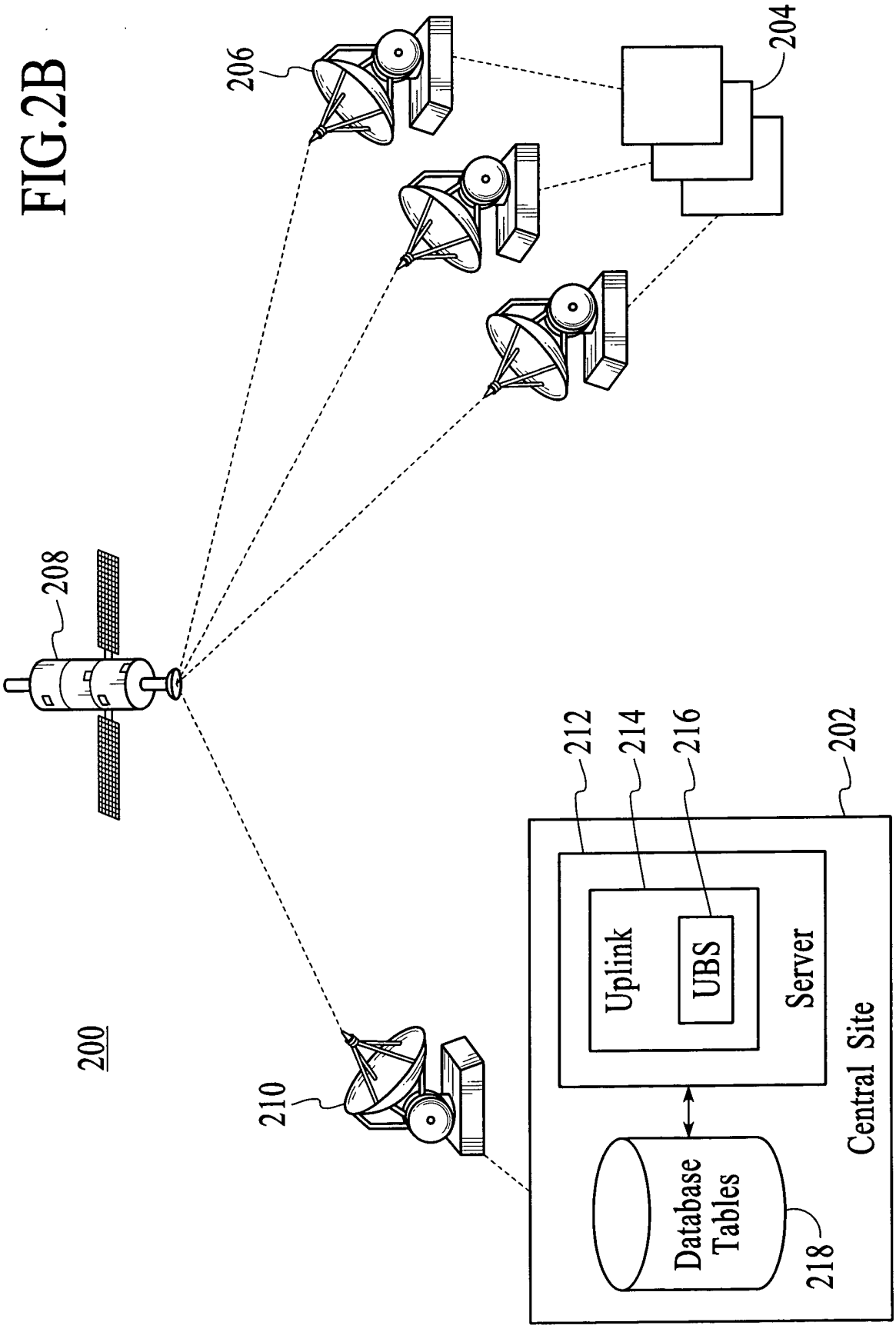

200
202
Central Site/
Home Office
Other Home Office Systems
Uplink
210
208
206
204
Downlinks
Remote Site
TCP/IP
Frame Relay
Dial-up
or WAN

FIG.2B


200
206
204
208
210
212
214
216
202
Uplink
UBS
Server
Central Site
Database Tables
218

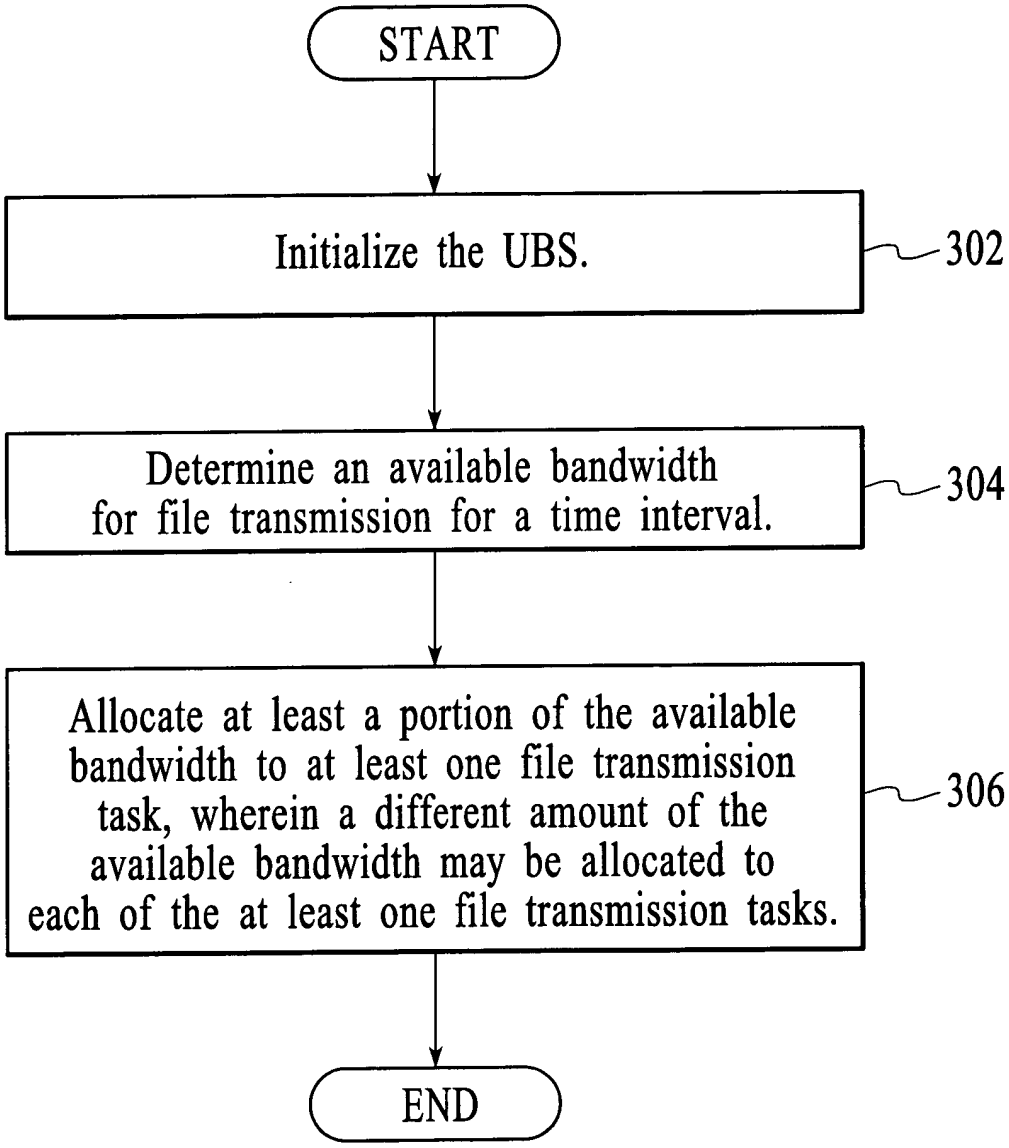
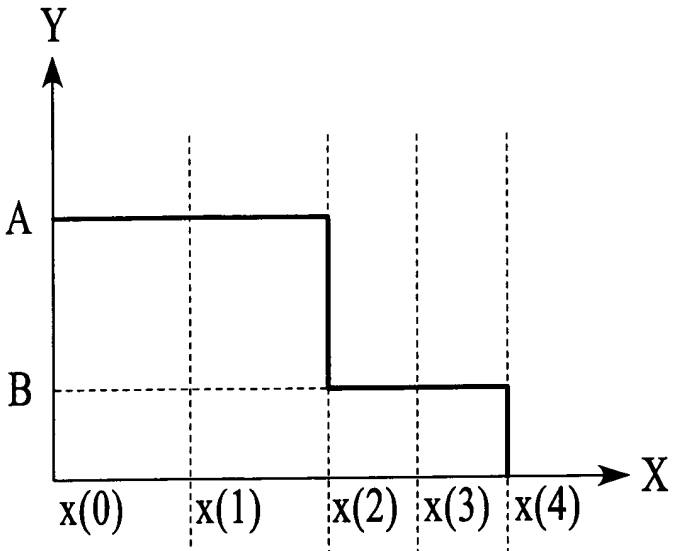
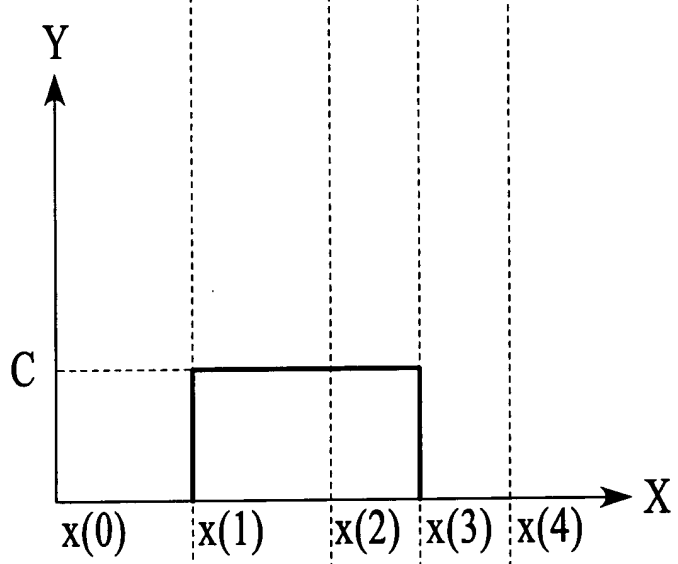

START
Initialize the UBS.
302
Determine an available bandwidth for file transmission for a time interval.
304
Allocate at least a portion of the available bandwidth to at least one file transmission task, wherein a different amount of the available bandwidth may be allocated to each of the at least one file transmission tasks.
306
END

FIG.3

Step Function 1



Step Function 2



Step Function 1 +
Step Function 2

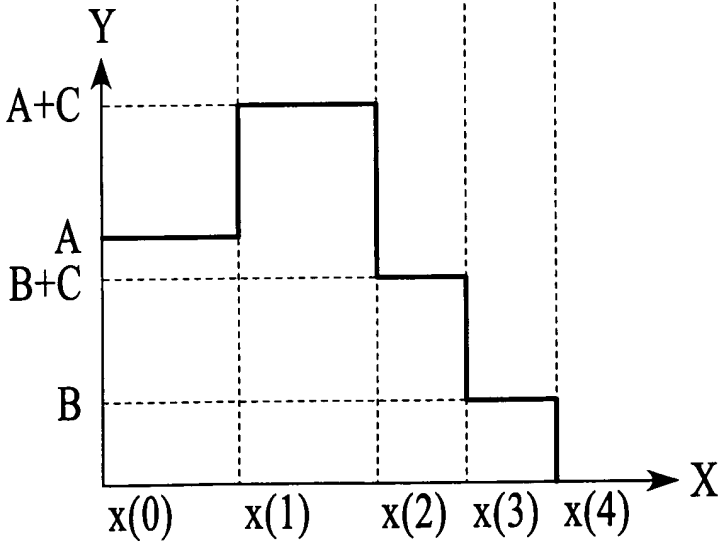
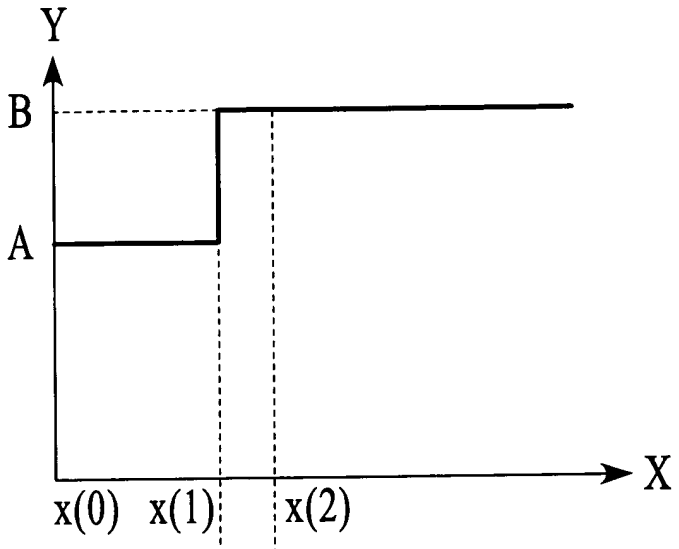
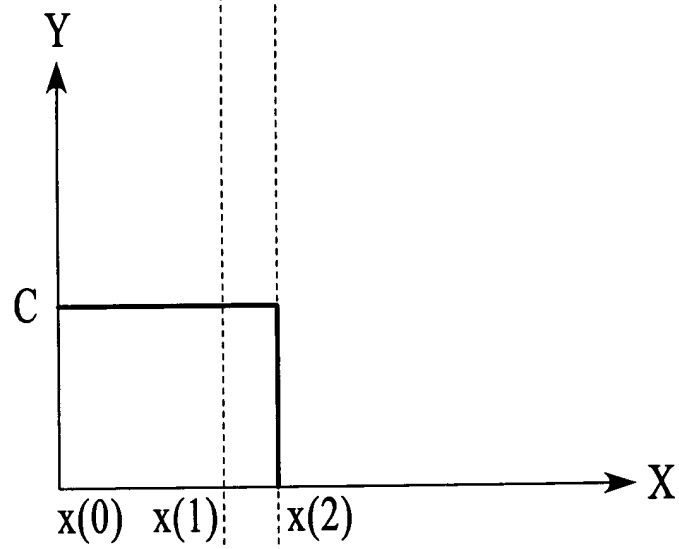


FIG.4A

Step Function 3



Step Function 4



Step Function 3 -
Step Function 4

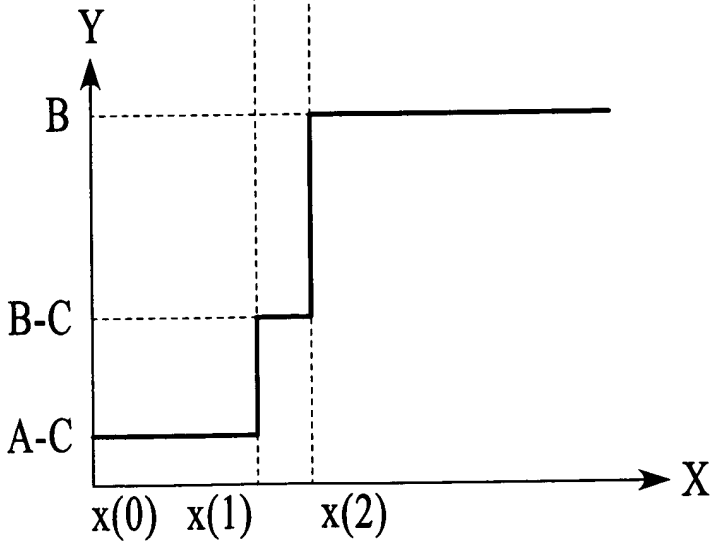


FIG.4B

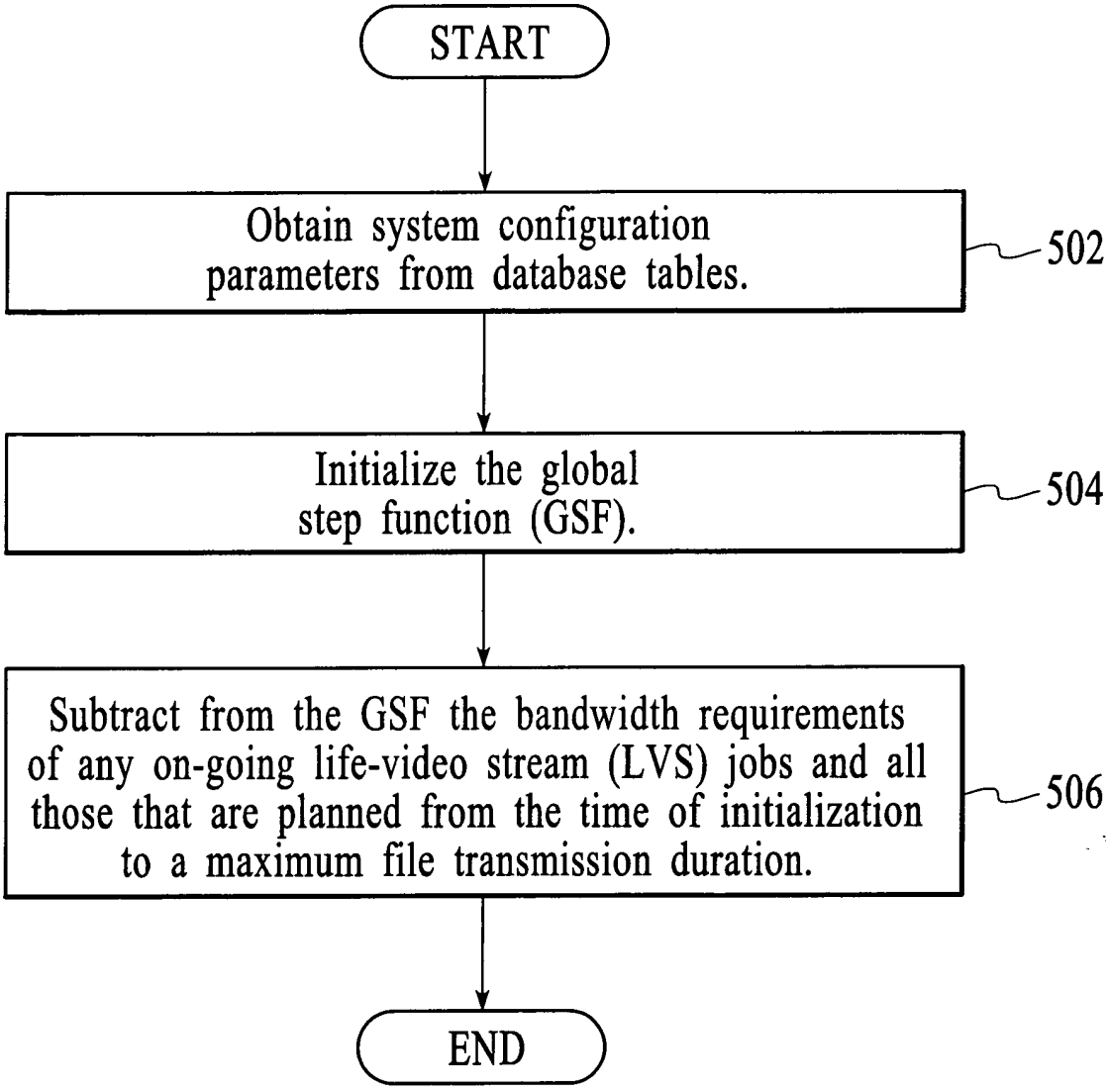

START
Obtain system configuration parameters from database tables.
502
Initialize the global step function (GSF).
504
Subtract from the GSF the bandwidth requirements of any on-going life-video stream (LVS) jobs and all those that are planned from the time of initialization to a maximum file transmission duration.
506
END

FIG.5

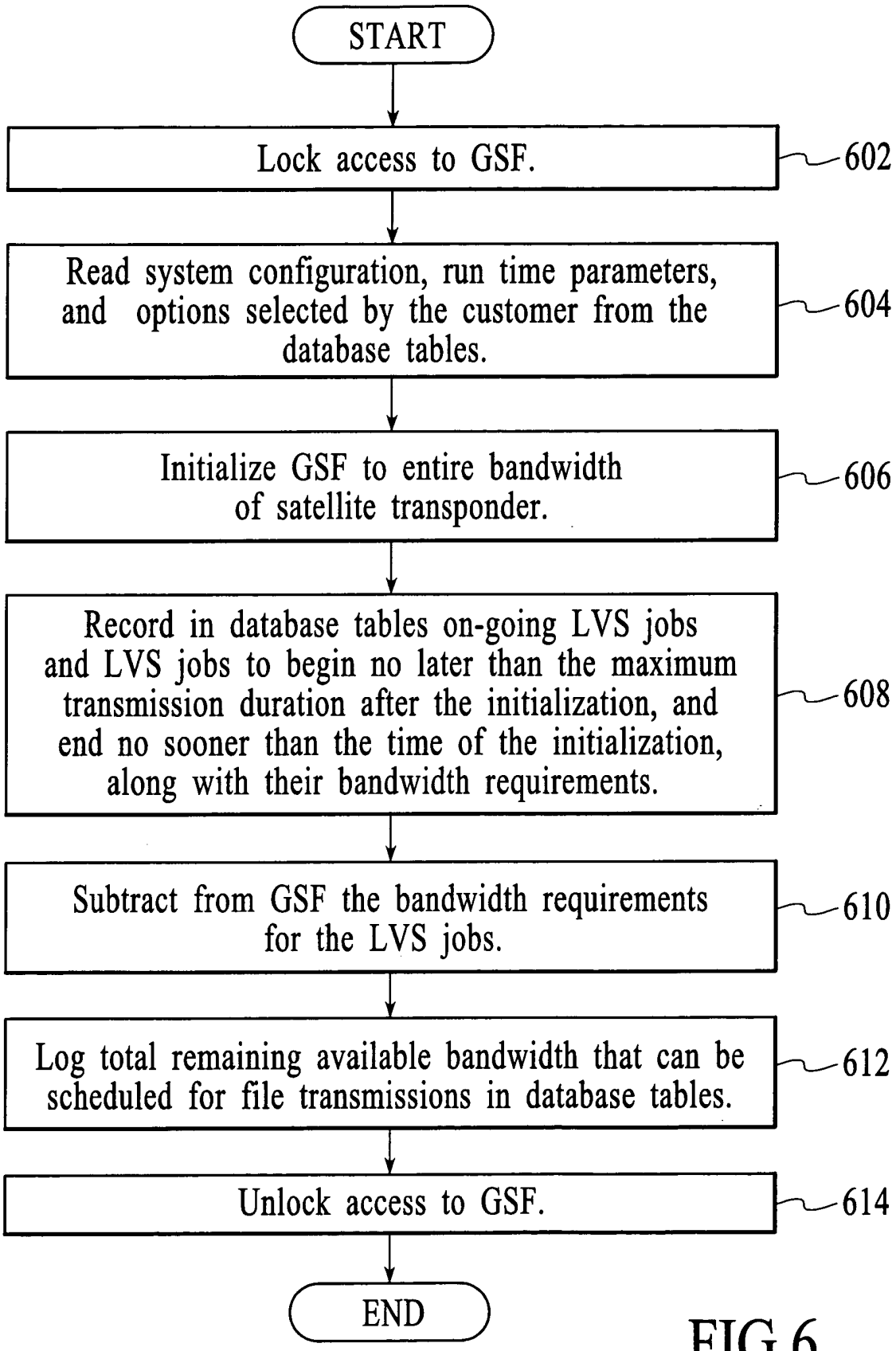

START
Lock access to GSF.
602
Read system configuration, run time parameters, and options selected by the customer from the database tables.
604
Initialize GSF to entire bandwidth of satellite transponder.
606
Record in database tables on-going LVS jobs and LVS jobs to begin no later than the maximum transmission duration after the initialization, and end no sooner than the time of the initialization, along with their bandwidth requirements.
608
Subtract from GSF the bandwidth requirements for the LVS jobs.
610
Log total remaining available bandwidth that can be scheduled for file transmissions in database tables.
612
Unlock access to GSF.
614
END

FIG.6

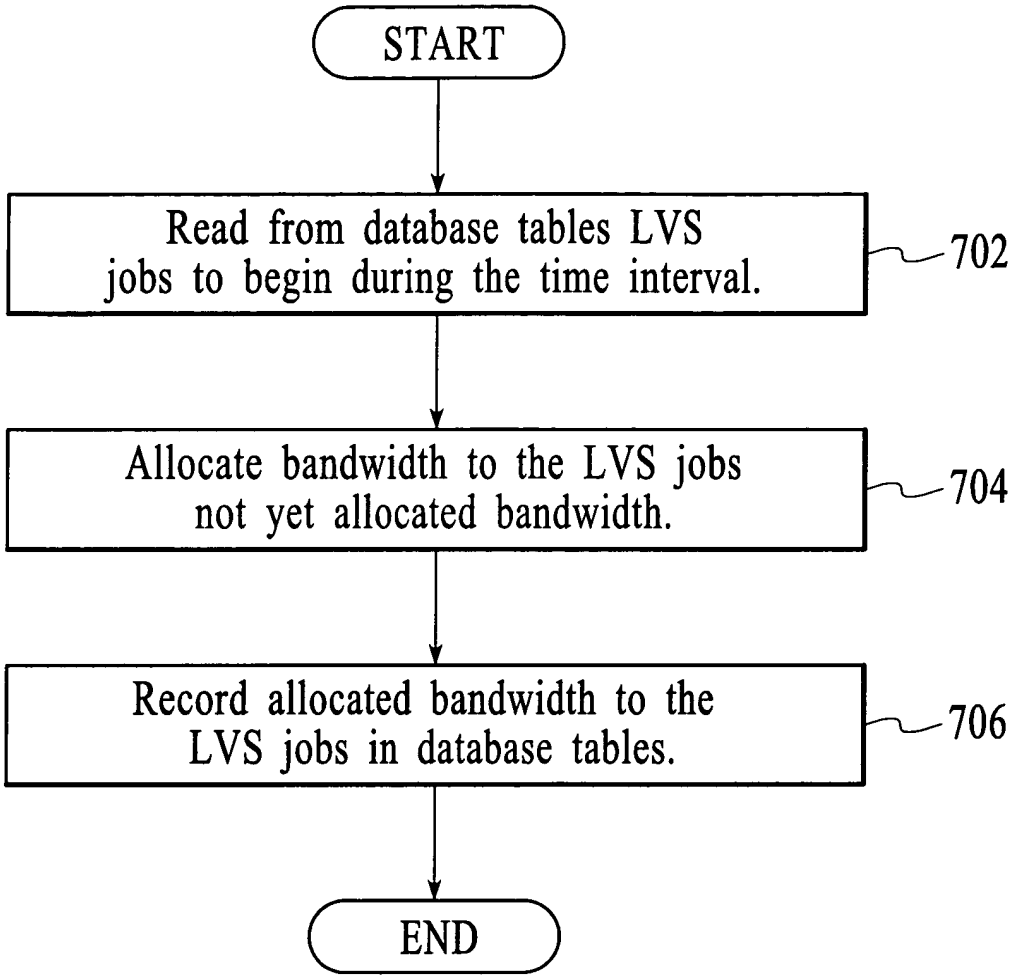

START
Read from database tables LVS jobs to begin during the time interval.
702
Allocate bandwidth to the LVS jobs not yet allocated bandwidth.
704
Record allocated bandwidth to the LVS jobs in database tables.
706
END

FIG.7

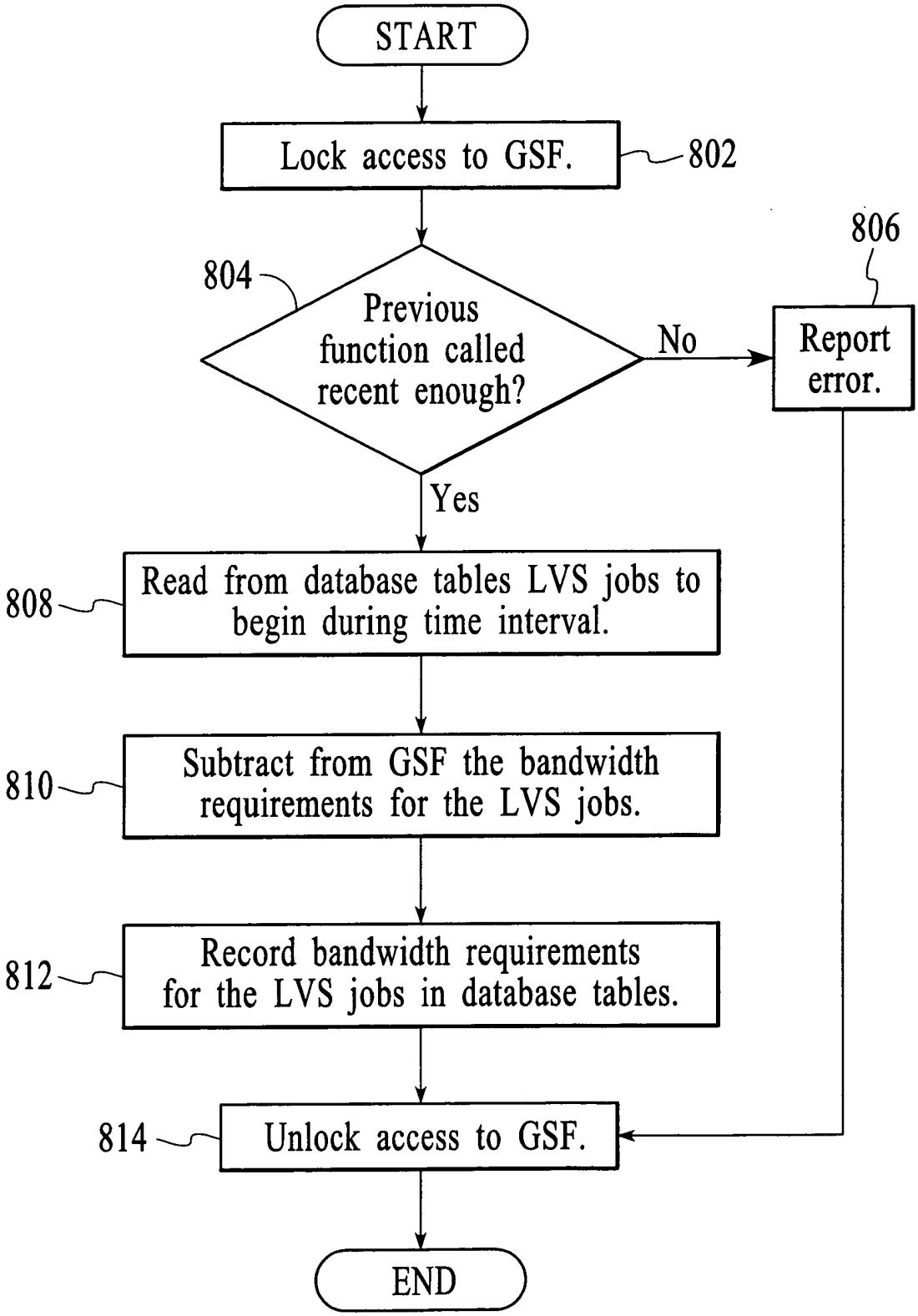

START
Lock access to GSF.
802
804
Previous function called recent enough?
No
806
Report error.
Yes
808
Read from database tables LVS jobs to begin during time interval.
810
Subtract from GSF the bandwidth requirements for the LVS jobs.
812
Record bandwidth requirements for the LVS jobs in database tables.
814
Unlock access to GSF.
END

FIG.8

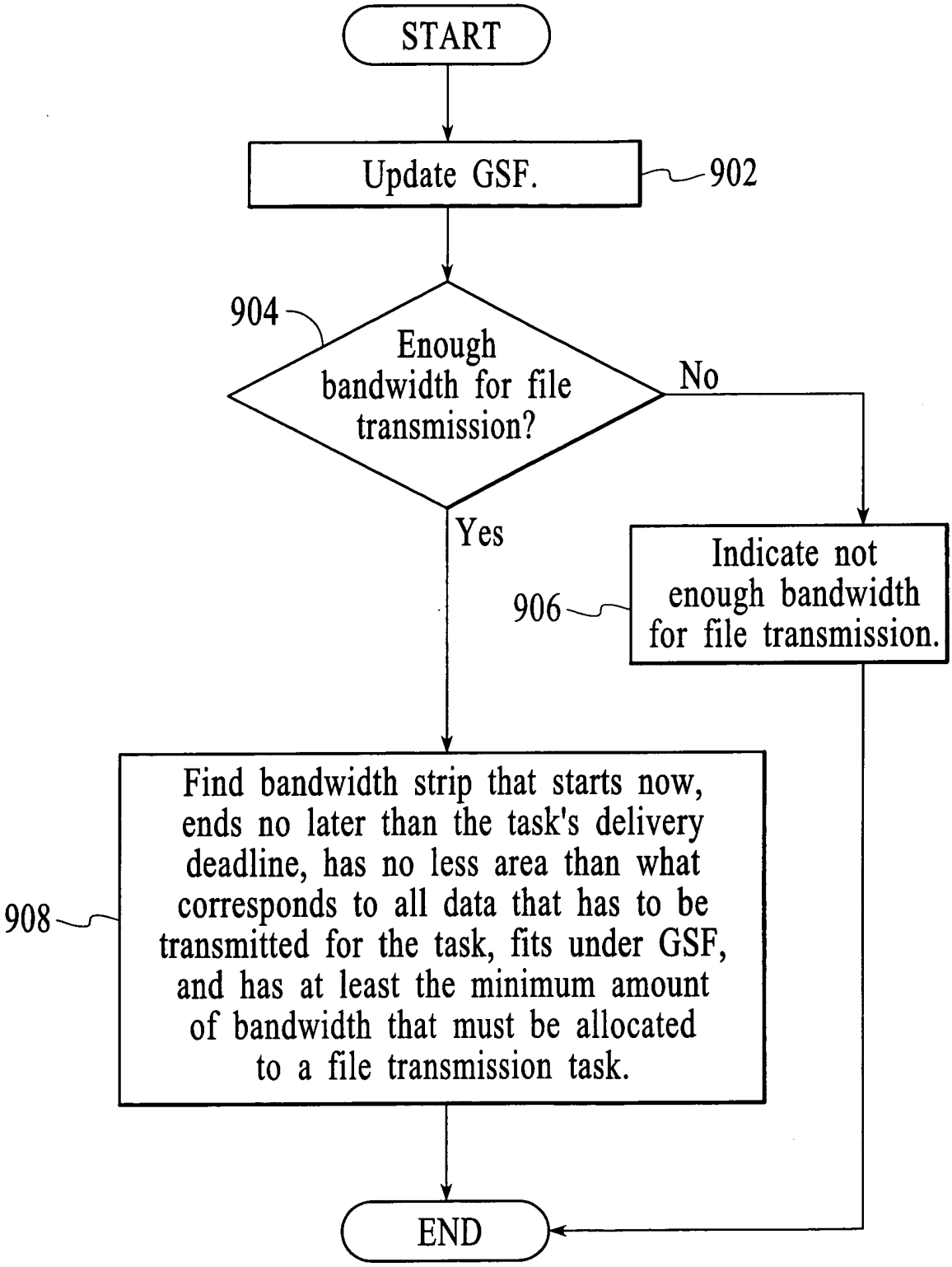

START
Update GSF.
902
904
Enough bandwidth for file transmission?
No
Yes
Indicate not enough bandwidth for file transmission.
906
Find bandwidth strip that starts now, ends no later than the task's delivery deadline, has no less area than what corresponds to all data that has to be transmitted for the task, fits under GSF, and has at least the minimum amount of bandwidth that must be allocated to a file transmission task.
908
END

FIG.9

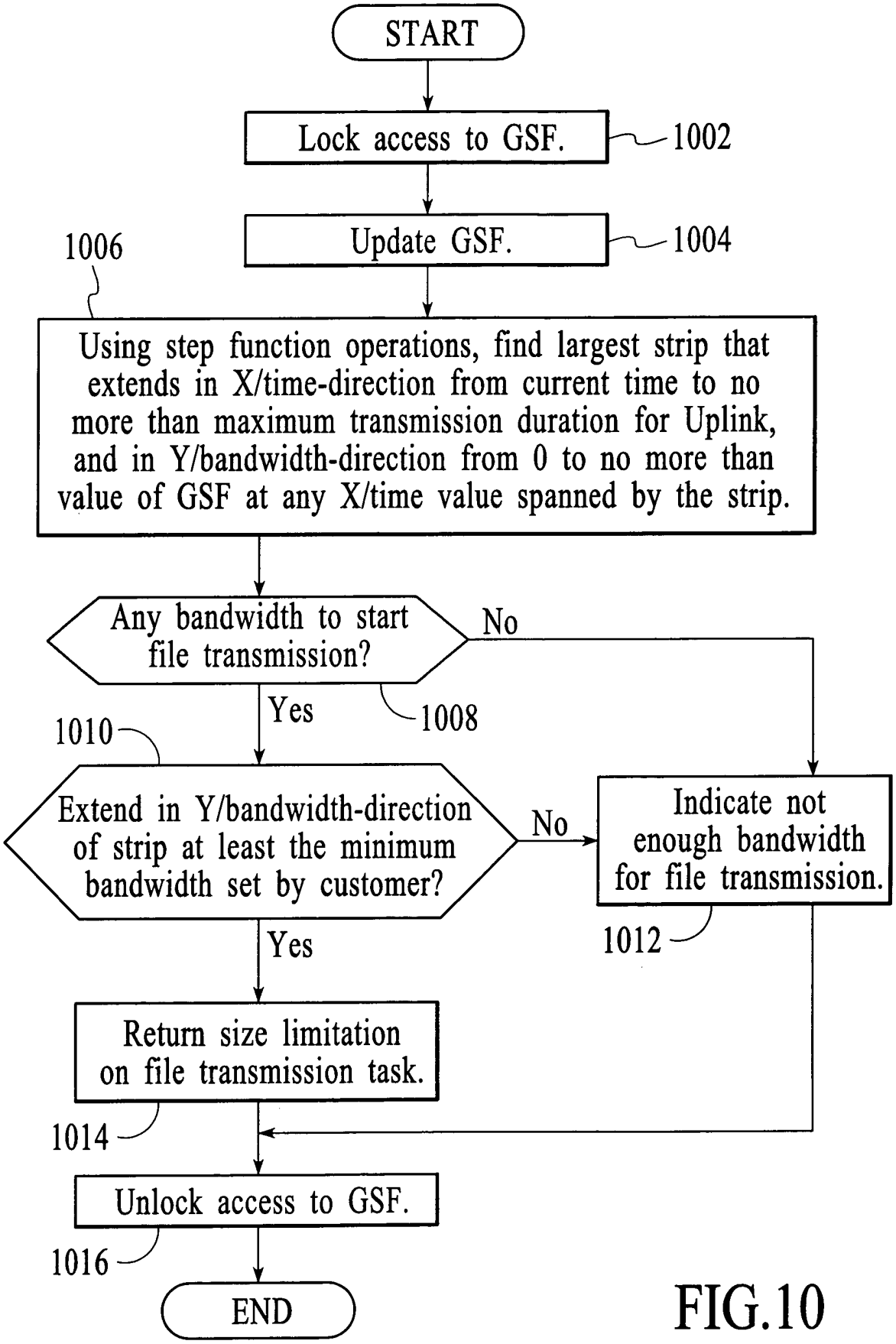

START
Lock access to GSF.
1002
Update GSF.
1004
1006
Using step function operations, find largest strip that extends in X/time-direction from current time to no more than maximum transmission duration for Uplink, and in Y/bandwidth-direction from 0 to no more than value of GSF at any X/time value spanned by the strip.
Any bandwidth to start file transmission?
No
Yes
1008
1010
Extend in Y/bandwidth-direction of strip at least the minimum bandwidth set by customer?
No
Indicate not enough bandwidth for file transmission.
1012
Yes
Return size limitation on file transmission task.
1014
Unlock access to GSF.
1016
END

FIG.10

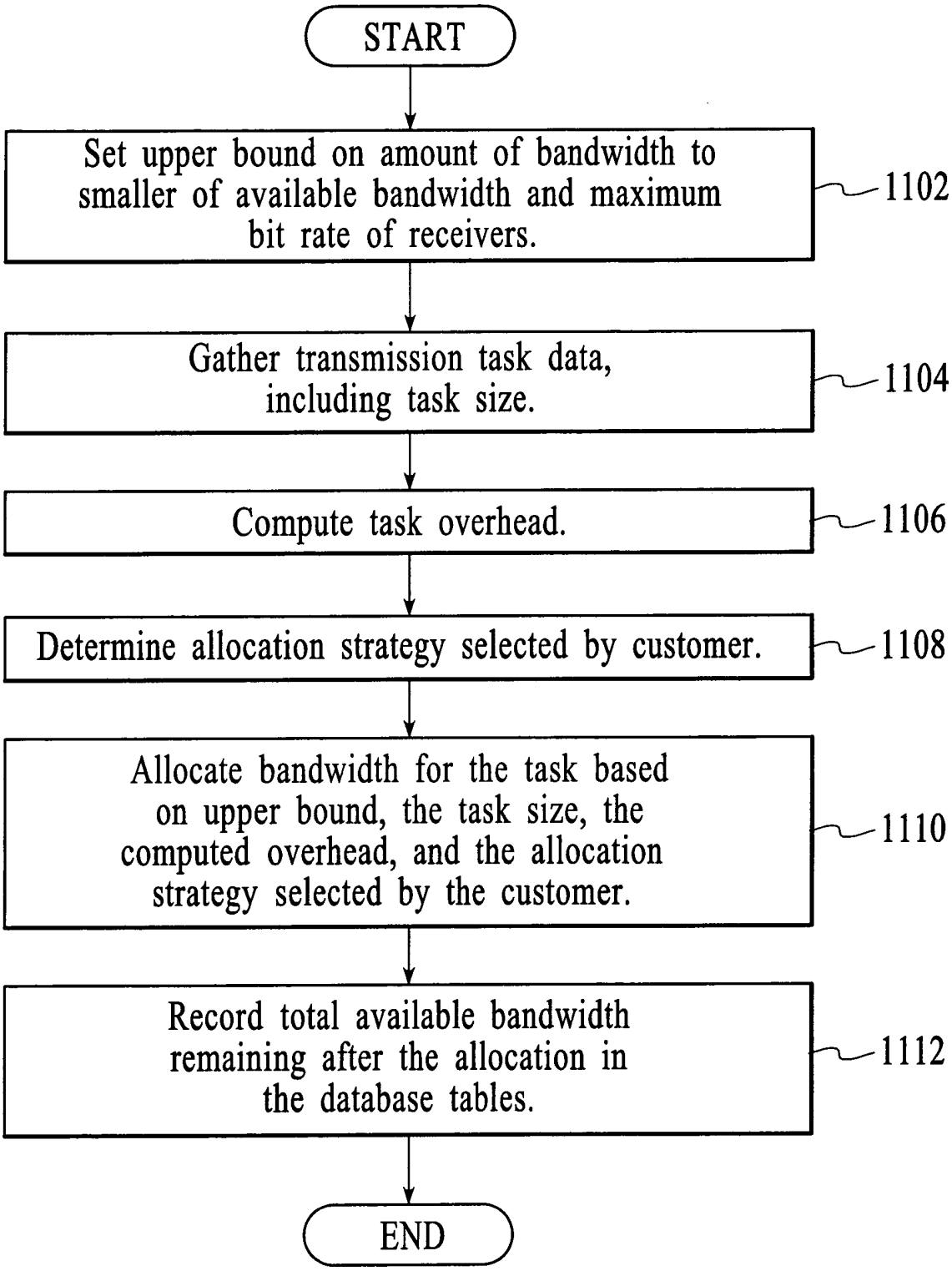

START
Set upper bound on amount of bandwidth to smaller of available bandwidth and maximum bit rate of receivers.
1102
Gather transmission task data, including task size.
1104
Compute task overhead.
1106
Determine allocation strategy selected by customer.
1108
Allocate bandwidth for the task based on upper bound, the task size, the computed overhead, and the allocation strategy selected by the customer.
1110
Record total available bandwidth remaining after the allocation in the database tables.
1112
END

FIG.11

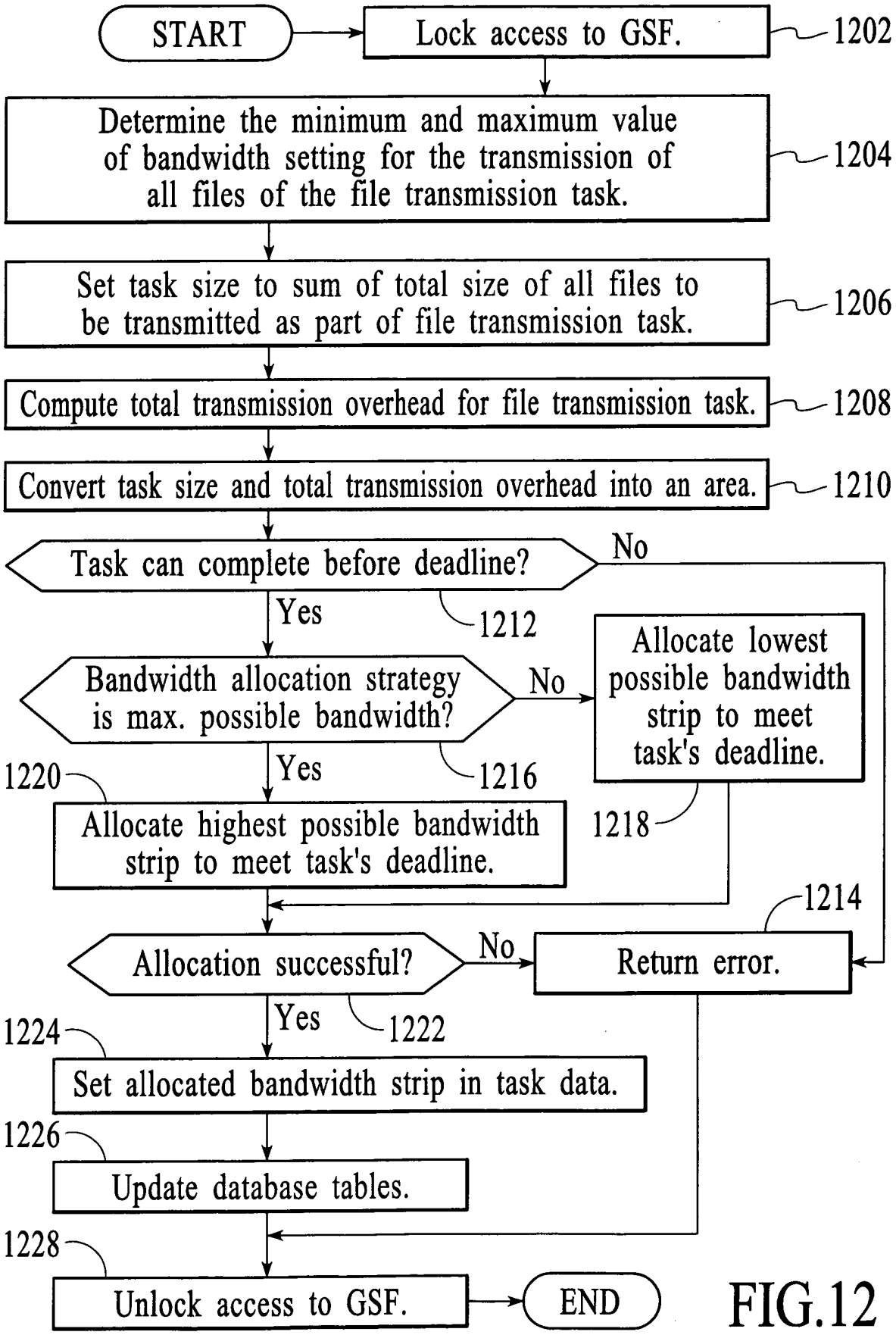

START
Lock access to GSF.
1202
Determine the minimum and maximum value of bandwidth setting for the transmission of all files of the file transmission task.
1204
Set task size to sum of total size of all files to be transmitted as part of file transmission task.
1206
Compute total transmission overhead for file transmission task.
1208
Convert task size and total transmission overhead into an area.
1210
Task can complete before deadline?
No
Yes
1212
Bandwidth allocation strategy is max. possible bandwidth?
No
Allocate lowest possible bandwidth strip to meet task's deadline.
Yes
1216
1220
Allocate highest possible bandwidth strip to meet task's deadline.
1218
1214
Allocation successful?
No
Return error.
Yes
1222
1224
Set allocated bandwidth strip in task data.
1226
Update database tables.
1228
Unlock access to GSF.
END

FIG.12

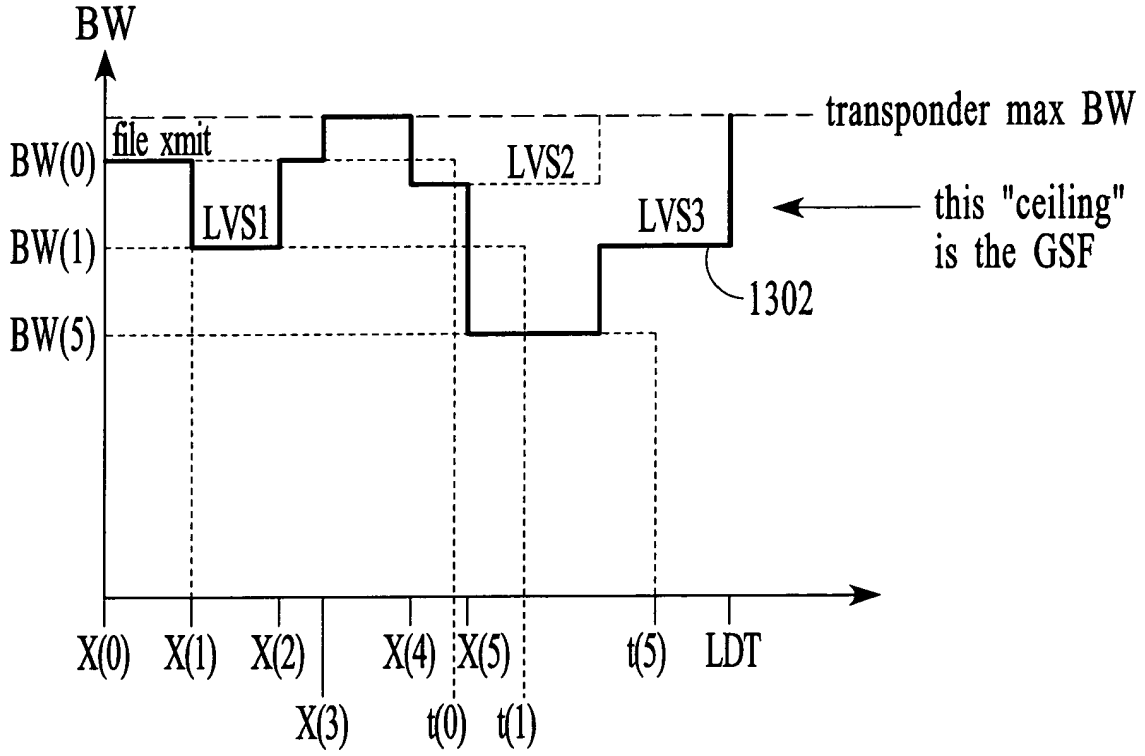


FIG.13A

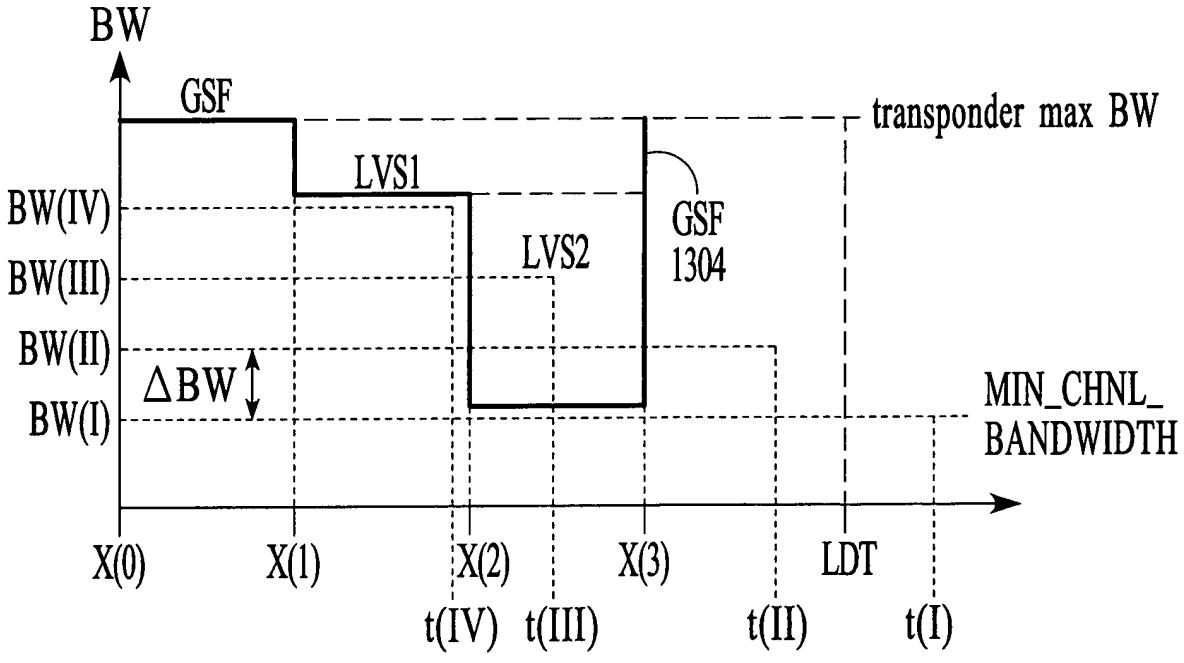


FIG.13B

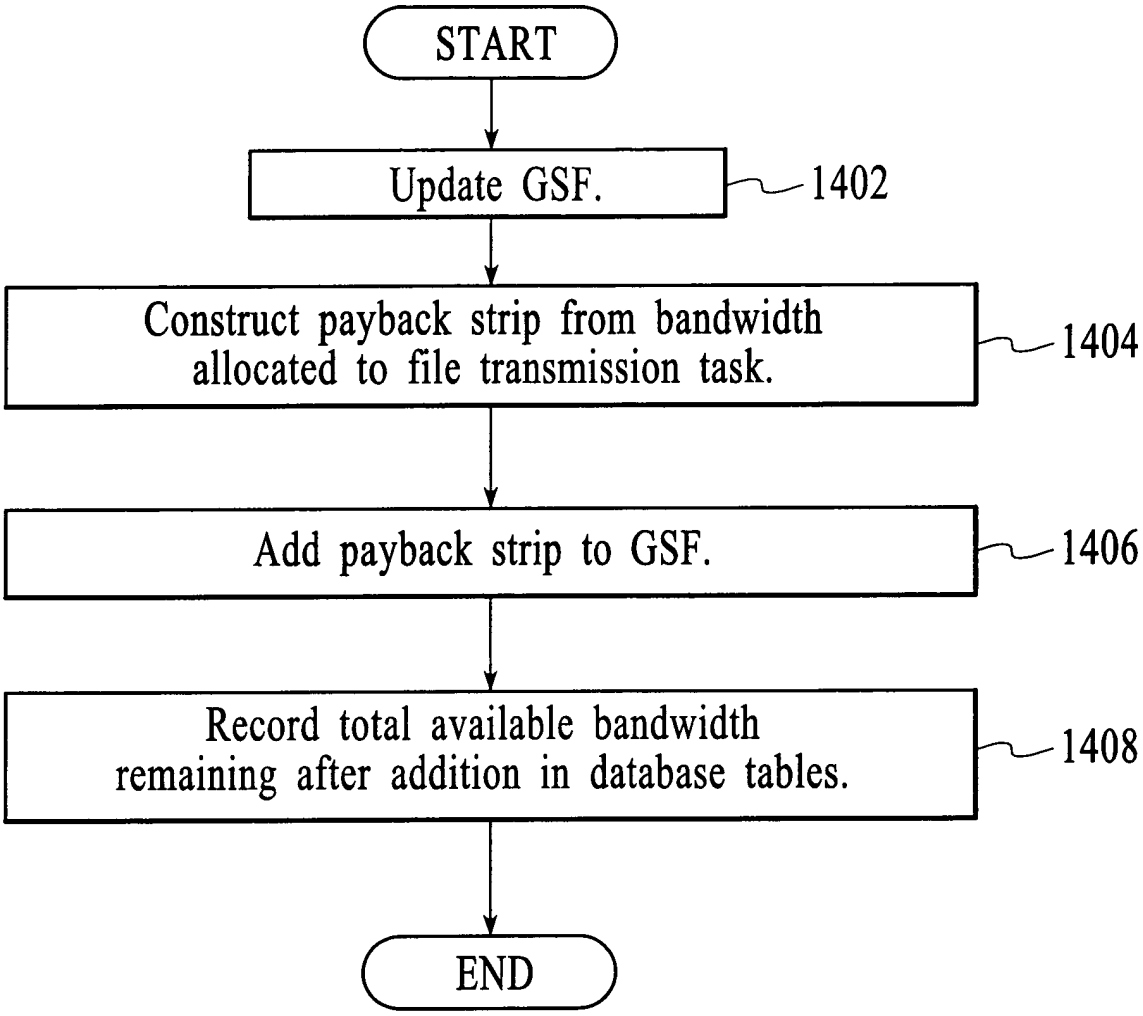

START
Update GSF.
1402
Construct payback strip from bandwidth allocated to file transmission task.
1404
Add payback strip to GSF.
1406
Record total available bandwidth remaining after addition in database tables.
1408
END

FIG.14

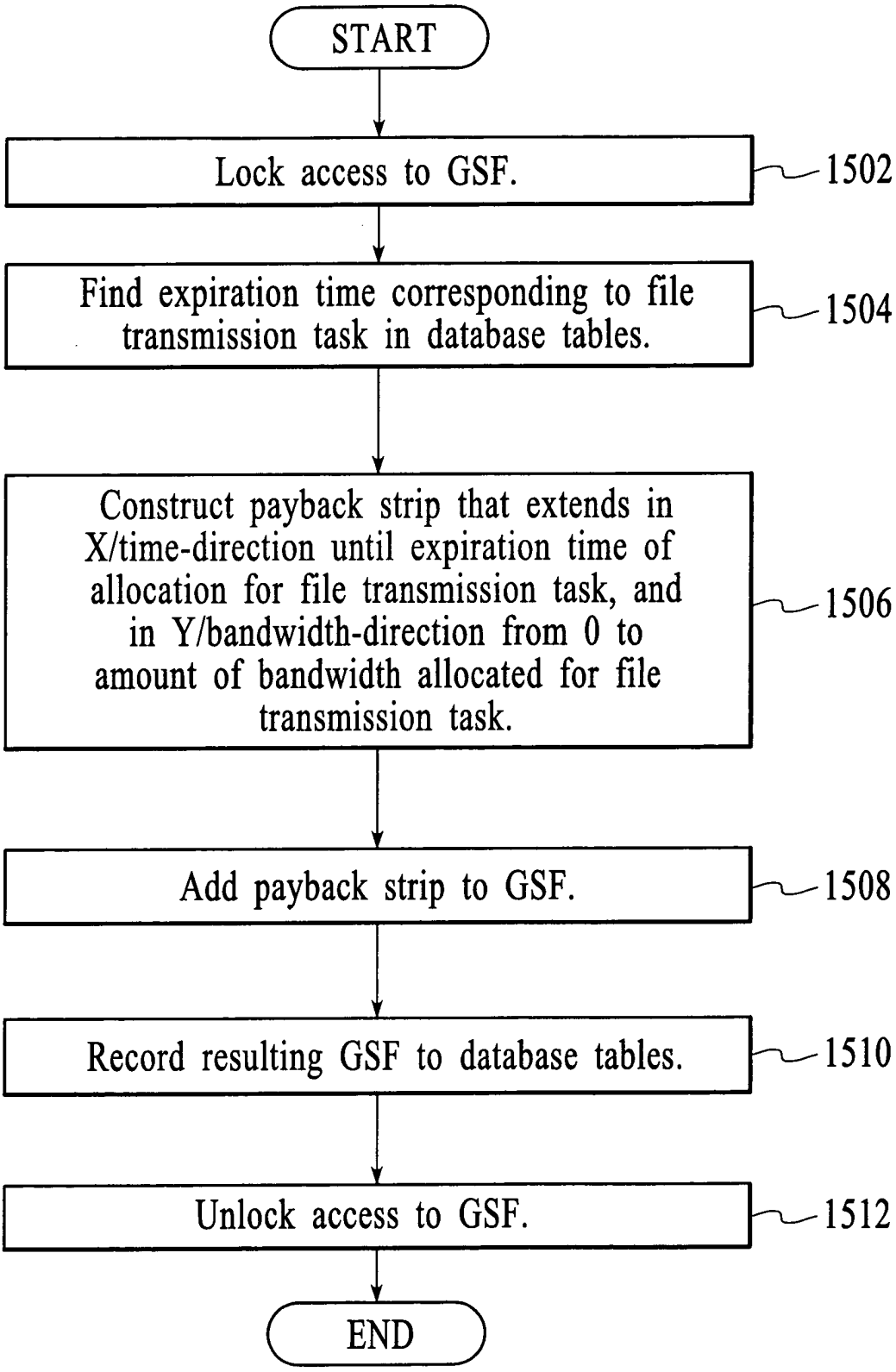

START
Lock access to GSF.
1502
Find expiration time corresponding to file transmission task in database tables.
1504
Construct payback strip that extends in X/time-direction until expiration time of allocation for file transmission task, and in Y/bandwidth-direction from 0 to amount of bandwidth allocated for file transmission task.
1506
Add payback strip to GSF.
1508
Record resulting GSF to database tables.
1510
Unlock access to GSF.
1512
END

FIG.15